

miRNA-based therapeutic potential of stem cell-derived extracellular vesicles: a safe cell-free treatment to ameliorate radiation-induced brain injury.

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Public Summary:

PURPOSE: This review compiles what is known about extracellular vesicles (EVs), their bioactive cargo, and how they might be used to treat radiation-induced brain injury. Radiotherapy (RT) is effective in cancer treatment, but can cause substantial damage to normal central nervous system tissue. Stem cell therapy has been shown to be effective in treating cognitive dysfunction arising from RT, but there remain safety concerns when grafting foreign stem cells into the brain (i.e. immunogenicity, teratoma). These limitations prompted the search for cell-free alternatives, and pointed to EVs that have been shown to have similar ameliorating effects in other tissues and injury models. **CONCLUSIONS:** EVs are nano-scale and lipid-bound vesicles that readily pass the blood-brain barrier. Arguably the most important bioactive cargo within EVs are RNAs, in particular microRNAs (miRNA). A single miRNA can modulate entire gene networks and signalling within the recipient cell. Determining functionally relevant miRNA could lead to therapeutic treatments where synthetically-derived EVs are used as delivery vectors for miRNA. Stem cell-derived EVs can be effective in treating brain injury including radiation-induced cognitive deficits. Of particular interest are systemic modes of administration which obviate the need for invasive procedures.

Scientific Abstract:

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